Atmospheric conditions during Smithsonian Observations December 1936

Date	Time from apparent noon	Temperature °C.	Wind, Beaufort	Visibility	Sky blueness	Cloudiness and remarks
Dec. 1	3:36 a. m.	−13.1	NNW 3	6	6	Few Cu; moderate to dense haze; instrument indoors.
5	3:19 a. m.	−2.8	NW 4	7	9	Zero clouds; moderate haze; instrument indoors.
5	0:08 p. m.	+.7	NW 5	8	8	1 Ci; light haze; Frcu near sun.
8	3:26 a. m.	−11.3	NE 3	6	9	Trace Acu; dense haze.
14	1:15 p. m.	+1.3	SW 2	7	9	2 Ci; moderate haze; instrument outdoors.
15	1:52 a. m.	+4.1	W 4	6	8	Zero clouds; dense haze.
18	2:10 a. m.	−6.8	NW 5	9	10	Zero clouds.
22	0:53 a. m.	−5.6	NW 6	9	11	Trace Cu.
22	0:26 a. m.	−6.1	NW 5	9	11	Trace Cu and Frcu.
23	0:56 a. m.	−6.9	WNW 3	8	10	Trace Ci.
24	2:09 a. m.	+1.4	SW 4	5	8	2 Ci; dense haze.
28	1:20 a. m.	+8.3	WNW 6	8	10	Trace Cist; trace Cu; moderate haze.
28	0:35 a. m.	+8.3	WNW 6	8	10	Trace Cist; Trace Cu; moderate haze.
29	0:37 a. m.	+2.8	ENE 3	8	9	4 Ci, moderate haze to NE.

POSITIONS AND AREAS OF SUN SPOTS

Note.—The reports for November and December 1936, not having been received in time, will be included in the January 1937 issue of the REVIEW.—*Ed.*

PROVISIONAL SUN-SPOT RELATIVE NUMBERS, DECEMBER 1936

[Dependent alone on observations at Zurich and its station at Arosa]

[Furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

December 1936	Relative numbers	December 1936	Relative numbers	December 1936	Relative numbers
1	*bdd* 193	11	*d* 82	21	*dd* 86
2	*b* ---	12	*Wc* 76	22	117
3	*a* ---	13	*d* 74	23	130
4	---	14	71	24	*Eaccd* 149
5	158	15	40	25	151
6	*Ec* 146	16	43	26	*a* 150
7	*aa* ---	17	*Wac* 70	27	*a* 151
8	*Ec* 134	18	*d* 88	28	*ad* 135
9	104	19	*a* 85	29	*Eacd* 167
10	*a* 107	20	74	30	*Eac* 200
				31	181

Mean, 27 days = 117.5.

a = Passage of an average-sized group through the central meridian.
b = Passage of a large group or spot through the central meridian.
c = New formation of a group developing into a middle-sized or large center of activity: E on the eastern part of the sun's disk; W, on the western part; M, in the central circle zone.
d = Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE, in charge]

By L. P. HARRISON

Mean free-air temperatures and relative humidities for December, as determined from airplane weather observations, are given in table 1. The "departures from normal" given in the table are based on "normals" derived from the number of observations indicated in the note at the foot of the table, where the numbers of years over which the observations were taken are given by the figures in parentheses. In general, the numbers of observations available for computing "normals" for the higher levels are less than those available for the lowest levels (represented by the data given in the footnote). To compensate for this discrepancy, the "normals" are obtained by applying the mean differences between the successive standard levels to the data for the lower levels, where the "normal" for the surface based on the indicated number of observations serves as the reference basis. The "normals" in each case include the data for the current month. It will be noted that many of the "normals" are based on only three years of observations. "Departures from normal" in such cases must be regarded as having little weight in comparison with departures from "normals" based on much more extended periods of record (35 or more years, say, which are not uncommon in climatology).

The mean temperatures for the month at the surface (see chart I) were above normal over practically the entire country. The greatest positive departures from normal temperature at the surface were to be found largely in the central part of the country, the southern portion of the Great Lakes area, the coastal strip extending approximately from Massachusetts to New Jersey, and also a small region from eastern Washington to western Montana. Departures in these areas generally were from +1.5° to nearly +3.5° C. Small regions of negative departure from normal were to be found in parts of northern and central California as well as eastern Montana.

The mean temperatures for the month in the free air (see table 1) were largely above normal in the eastern third, and in a portion of the central part, of the country. The greatest positive departures from normal temperature in the free air were largely concentrated in the area encompassed by the stations at Boston, Lakehurst, Mitchel Field, Scott Field, and Wright Field, where the departures for these respective places ranged as follows in the free-air levels for which data were available: +3.4° to 4.6° C., 2.6° to 5.5° C., 4.4° to 6.9° C., 1.4° to 3.8° C., and 2.7° to 4.7° C.

Negative departures from normal free-air temperatures during December were generally small in magnitude and were mostly confined to the western third of the country with extensions in the north-central and south-central areas. The negative departures were most pronounced at Spokane and San Diego (−0.8° to −3.5° C., and −1.1° to −2.3° C., respectively).

Mean monthly free-air relative humidities during the month under review were appreciably below normal in the eastern third of the country at all levels except those within 0.5 to 2 km of the ground in some cases, where above-normal humidities prevailed in a slight degree. The region of most marked negative departure from normal relative humidity could be identified with the region of greatest positive departures from normal of temperature referred to above. This condition was most pronounced in the levels from about 1.5 to 4 km above sea level, where departures as great as −16 to −18 percent occurred at Lakehurst, Mitchel Field, and Wright Field. (It is possible that these values are somewhat greater than they should be, owing to the lack of a full month's observations—19, 18, and 20 observations, respectively, being actually available—and the absence of data principally for days with low clouds, precipitation, etc.) The layer of marked subnormal humidities occurred at somewhat lower elevations in the southwestern portion of

the area under consideration than in the northeastern portion, as may be noted from the fact that the maximum negative departures were observed at 1.5 and 1.0 km at Wright Field and Scott Field, respectively, whereas they were observed at 4 and 3 km at Boston and Mitchel Field, respectively.

Mean free-air relative humidities for the month were above normal by rather slight amounts over the central portion of the country; below normal by significant amounts in the lowest kilometer over the north-central portion (note −6 to −11 percent at Fargo, N. Dak.); and practically normal above that layer, as well as practically normal in the south-central portion.

The mean monthly free-air relative humidities in the western third of the country generally exceeded the normals by moderate amounts. The most pronounced positive departures were to be found at San Diego and Spokane, where they ranged from +8 to +11 percent and +5 to +12 percent, respectively, in the layer 1.5 to 5 km above sea level.

The free-air resultant winds based on pilot balloon observations made near 5 a. m. (75th meridian time) during December are given in table 2. The region near to, and also to the east of, the Appalachian Mountain system as far as the Atlantic coast, was characterized by free-air resultant winds which were generally near normal in direction but sub-normal in velocity. The resultant winds at Atlanta in the 0.5 and 1 km levels are exceptions to this statement as may be seen by comparing the direction (azimuth from N.) and velocity (m. p. s.) values for the normal (in parentheses) and the month under review, respectively: (318°, 2.8) 68°, 3.1 (297°, 4.9) 79°, 1.9. In the region in question, negative departures from normal of the resultant velocity were quite considerable (>3 m. p. s.) in a number of cases within the layer from 1 to 3 km above sea level. At Boston and Washington, the departures were −5.0 and −6.1 m. p. s., respectively, at the 2.5 km level where the departures were most extreme.

At Key West, the resultant winds were near normal in direction and only slightly above normal in velocity.

Except near Sault Ste. Marie with regard to direction (so far as available data are concerned), the free-air resultant winds in the Great Lakes region were generally normal in direction but slightly above normal in velocity. This may also be extended to include Fargo, N. Dak. At Sault Ste. Marie the relationship which existed between the normal (in parentheses) and the month's resultant winds at the surface, 0.5, and 1 km levels, respectively, may be seen from the following data therefor: (49°. 0.2), 157°, 0.9 (273°, 1.5), 230°, 4.0 (292°, 3.1), 235° 6.6.

In the levels from about 0.5 to 1.5 km above sea level, especially in the lower part of this stratum, the monthly wind resultants for Oklahoma City, Murfreesboro, Cincinnati, St. Louis, and Omaha, were appreciably oriented from a more southerly component in direction than the normal by amounts varying from 0 to 80°. This condition was most pronounced at the southern stations. These stations generally had slight to moderate negative departures from normal resultant velocities, except Oklahoma City, where moderate positive departures prevailed from the surface to 1.5 km above sea level as exemplified by the following comparisons: (Normal in parentheses and month's resultant) 0.5 km (244,° 2.0), 190°, 5.5; 1 km (272°, 4.9), 231°, 8.4; 1.5 km (281°, 5.8), 249°, 6.6. The corresponding data for Houston are of interest: (187°, 2.1), 95°, 2.5 (244°, 3.5), 291°, 1.2 (267°, 5.0), 302°, 3.3. From 2 to 3 km, the resultants for this station were normal in direction but slightly below normal in velocity. It thus appears that there occurred a greater than normal transport of air up the Mississippi Valley in the lower levels, while at upper levels, the customary westerly drift was weakened.

In the plateau region, the resultant directions were near normal but the resultant velocities were generally above normal by slight amounts except up to about 2.5 km above sea level at Cheyenne and Billings (627 and 1,411 meters above ground, respectively), where they were below normal by slight amounts. Spokane had remarkable positive departures from normal velocity at the 1.5, 2.5, 3, and 4 km levels as may be seen from the following data: +3.0, +4.1, +8.4, and +6.9 m. p. s., respectively.

At Medford, Oreg., near the Pacific coast, the monthly resultants at the 0.5, 1, 2.5, and 3 km levels were oriented from 52° to 126° clockwise with respect to normal. At the 1.5 km level the direction was normal, while at the 2 km level it was oriented about 45° counterclockwise. The resultant velocities were slightly below normal. Conditions were accordingly such as to produce by these changes in direction a greater than normal transport of air from off the Pacific Ocean in the Northwestern States. At San Diego and Oakland, the resultant winds did not in general depart much from the normal directions and velocities, except at the 3 km level over the latter place where a departure of +3.2 m. p. s. occurred in the velocity.

The distributions of meteorological elements presented by the tabular data discussed above are of course the consequences of the passages of divers air masses and their interactions. It is therefore of interest to consider the "air mass history" of the month and to relate it to the observed mean distribution of the precipitation, temperature, humidity, etc. For somewhat over half of the month under review the trend of meteorological events to a considerable degree may be regarded as representing a persistence of the trends which were so strongly in evidence during the preceding month (see the November summary of *Aerological Observations*). Thus a number of offshoots of the well-developed north Pacific HIGH crossed over our Pacific coast and brought with them P_P air masses which contributed in a large measure to the conditions that later prevailed to the east. The high pressure systems which arose in this way over the middle Pacific coast region produced an accentuated transport of moist air from the ocean into the Northwestern States (note above discussion regarding resultant winds in that region). The frontal surfaces of the P_C air masses which frequently moved down over our northern border afforded a means whereby this moist air could be elevated with the consequent production of abnormally high precipitation in northern Idaho and Montana (200 percent of normal near Havre—see *Weekly Weather and Crop Bulletin*, January 13, 1937, and inset map on chart V of this REVIEW). The P_P HIGHS, reinforced to some extent by the P_C air masses just referred to, produced deficient precipitation and subnormal free-air temperatures in other parts of the northwest, the middle and the north Pacific coasts, and the eastern plateau region.

In the Pacific Southwest and adjacent plateau region a number of LOWS formed as waves in the southern peripheries of the P_P HIGHS and moved eastward, thus causing somewhat supernormal precipitation in that area when N_{PP} and T_P air masses overrode the denser P_P air.

The trajectory of the P_P and N_{PP} air masses along the eastern plateau region was attended by considerable subsidence, and superior dry air not infrequently made its appearance along the extremes of its southward movement in western Texas and the Gulf of Mexico. This doubtless contributed to the generally deficient precipitation along the Gulf coast.

The moist N_{PP} (and relatively warm P_P) air after passing over the plateau was frequently brought under the influence of the HIGHS of P_C origin which moved down over the north-central part of the country, and the trajectories of the former air masses were such as to carry them around the eastern peripheries of the P_P HIGHS and then northward and eastward around and across the peripheries of colder P_C and P_P HIGHS. The resultant ascent of the moist air in somewhat abnormal amount gave rise to above-normal precipitation in the Mississippi Valley.

The considerable southward movements of the P_C and P_P air masses and HIGHS prevented much warm, moist air from flowing up the Mississippi Valley, but the N_{PP} and T_M air masses reacting upon the southern frontal boundaries of these colder air masses produced waves therein with the consequent development of LOWS. These progressed eastward and then northward along the peripheries of the HIGHS so that the region near to and especially east of the Appalachian Mountain chain received an abundant supply of precipitation, particularly along the coast.

The conditions of deficient humidity and precipitation as well as of excessive temperatures, noted in the region south of the Great Lakes from St. Louis northeastward, were presumably connected with the subsidence which occurred in the N_{PP} air masses after the climax had been passed following the active stage of their role in the cyclones that were formed by the interactions thereof (and the relatively warmer P_P air masses) upon the colder P_C and P_P air masses.

TABLE 1.—*Mean free-air temperatures and relative humidities obtained by airplanes during December 1936*

TEMPERATURE (° C.)

Station	Altitude (meters) m. s. l.																Number of observations
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	
Barksdale Field (Shreveport), La.[1] (52 m)	6.7		10.0		7.7		6.7		5.9		3.8		1.5		−3.4		−10.6		24
Billings, Mont.[2] (1089 m)	−3.5	−0.6					−1.0	−1.3	−2.5	−1.3	−5.1	−1.2	−8.4	−1.0	−14.9	−1.2	−21.7	−1.4	30
Boston, Mass.[1] (5 m)	1.0	+3.0	0.8	+3.4	−0.4	+3.4	−0.7	+4.0	−1.5	+4.4	−3.8	+4.0	−6.1	+4.0	−11.3	+3.7	−16.1	+4.6	21
Cheyenne, Wyo.[2] (1873 m)	−3.8	−0.2							−2.4	−0.6	−1.8	−0.2	−4.1	+0.3	−9.9	+0.4	−16.8	+0.3	31
El Paso, Tex.[2] (1194 m)	3.4						6.7		6.4		4.0		1.4		−4.0		−10.2		31
Fargo, N. Dak.[2] (274 m)	−11.2	+0.7	−9.0	+1.9	−7.7	+1.0	−7.1	0.0	−8.2	−0.4	−10.3	−0.6	−12.6	−0.7	−18.0	−0.7	−24.5	−0.9	27
Kelly Field (San Antonio), Tex.[1] (206 m)	7.0	−0.5	11.7	+0.8	10.7	+0.4	8.8	−0.4	7.2	−0.6	5.9	−0.2	3.4	−0.7	−3.5	−1.4	−10.8	−1.6	27
Lakehurst, N. J.[2] (39 m)	−0.4	+1.4	0.9	+2.6	0.5	+3.9	0.6	+4.9	−0.4	+5.1	−2.6	+5.3	−4.5	+5.5	−9.9	+5.2			19
Maxwell Field (Montgomery), Ala.[1] (52 m)	7.9	+3.4	9.5	+3.0	8.8	+2.7	7.8	+2.2	6.3	+1.7	4.4	+1.4	2.3	+1.4	−3.0	+1.8	−9.1	+1.3	19
Miami, Fla.[2] (4 m)	18.1		18.9		15.5		12.8		10.9		9.1		6.9		1.7		−5.0		31
Mitchel Field (Hempstead, L. I.), N. Y.[1] (29 m)	0.2	+2.2	1.5	+4.4	1.0	+5.3	1.2	+6.4	−0.4	+6.1	−2.0	+6.6	−3.9	+6.9	−10.1	+6.0			18
Murfreesboro, Tenn.[2] (174 m)	2.9	+1.3	5.1	+2.1	5.3	+2.9	4.1	+2.5	2.5	+2.0	0.4	+1.9	−2.0	+1.7	−7.1	+1.2	−12.7	+1.7	30
Norfolk, Va.[2] (10 m)	3.7	−0.5	4.4	+0.6	3.8	+1.4	2.9	+1.6	1.6	+1.5	−0.4	+1.4	−2.8	+0.9	−8.2	+0.7	−14.5	+0.1	14
Oakland, Calif.[2] (2 m)	6.9		9.5		7.9		6.1		3.8		1.4		−1.4		−7.9		−15.0		31
Oklahoma City, Okla.[2] (391 m)	4.0	+1.7	4.9	+1.3	7.2	+1.7	6.1	+1.6	4.4	+1.7	2.3	+1.8	−0.4	+1.7	−5.8	+1.6	−13.0	+1.4	31
Omaha, Nebr.[2] (300 m)	−3.0	+1.2	−1.9	+1.5	−0.1	+1.6	0.5	+1.2	−1.4	+0.5	−4.1	0.0	−6.9	−0.4	−13.1	−0.7	−19.8	−1.0	31
Pearl Harbor, Territory of Hawaii[3] (6 m)																			
Pensacola, Fla.[3] (13 m)	10.2	+0.7	11.7	+1.6	11.3	+1.6	9.5	+1.0	7.9	+0.8	5.5	+0.4	4.0	+1.0	−1.4	+0.6	−7.3	+0.5	28
Salt Lake City, Utah[2] (1288 m)	0.9						2.4		1.9		−0.7		−3.5		−8.4		−14.1		31
San Diego, Calif.[3] (10 m)	10.0	−1.7	13.1	0.0	11.0	−1.1	8.5	−1.3	5.9	−1.6	3.4	−1.6	0.7	−1.7	−5.5	−1.9	−12.1	−2.3	30
Sault Ste. Marie, Mich.[2] (221 m)	−5.3		−5.2		−6.0		−6.1		−7.3		−8.7		−11.2		−17.0		−23.7		28
Scott Field (Belleville), Ill.[1] (135 m)	−2.4	+1.1	1.8	+3.0	3.5	+3.8	2.4	+3.3	0.9	+3.0	−1.4	+2.7	−3.2	+2.5	−8.4	+2.2	−14.9	+1.4	20
Seattle, Wash.[3] (10 m)	4.7		1.6		−1.0		−3.7		−7.2		−10.2		−12.6		−18.9				9
Selfridge Field (Mount Clemens), Mich.[1] (177 m)	−2.5		−0.2		−0.7		−0.6		−1.9		−3.9		−6.4		−11.0		−16.6		27
Spokane, Wash.[2] (596 m)	0.7	+0.5			0.8	+0.1	−0.3	−0.8	−3.0	−2.2	−6.1	−3.0	−9.4	−3.5	−15.4	−3.4	−21.0	−2.5	31
Washington, D. C.[3] (13 m)	1.2	−0.2	2.8	+1.2	1.7	+1.3	1.4	+2.1	1.1	+2.8	−1.3	+2.5	−3.7	+1.7	−8.7	+1.3	−14.6	+0.9	24
Wright Field (Dayton), Ohio[1] (244 m)	−1.7	+2.0	−0.4	+2.8	0.9	+3.9	1.1	+4.7	−0.6	+4.3	−2.9	+3.9	−5.3	+3.5	−10.6	+2.8	−16.4	+2.7	20

RELATIVE HUMIDITY (PERCENT)

Barksdale Field (Shreveport), La.	84		64		64		57		49		46		44		38		35		
Billings, Mont.	67	0					60	+3	59	+4	61	+5	64	+5	63	+5	63	+8	
Boston, Mass.	74	+3	71	+2	69	+2	59	−3	48	−8	45	−9	46	−7	41	−10	42	−6	
Cheyenne, Wyo.	63	0							61	+1	55	+1	54	0	52	+1	51	+2	
El Paso, Tex.	70						52		46		45		41		32		30		
Fargo, N. Dak.	77	−6	69	−11	64	−8	61	−2	54	−3	52	−2	51	0	48	−1	48	+1	
Kelly Field (San Antonio), Tex.	88	+1	67	−1	56	−2	52	0	52	+4	42	−1	37	−1	35	+1	32	+1	
Lakehurst, N. J.	74	−2	64	−7	59	−10	45	−17	39	−18	42	−14	36	−16	36	−12			
Maxwell Field (Montgomery), Ala.	78	0	64	0	60	+3	47	+1	40	+1	37	+1	33	−1	29	−3	25	−5	
Miami, Fla.	88		77		79		69		63		55		47		35		31		
Mitchel Field (Hempstead, L. I.), N. Y.	78	0	71	−2	66	−4	55	−8	45	−12	38	−16	33	−17	34	−11			
Murfreesboro, Tenn.	90	+6	75	+1	58	−8	56	−2	51	0	50	+1	48	+3	40	−1	39	−2	
Norfolk, Va.	77	+6	63	+1	51	−6	46	−5	41	−4	38	−5	36	−5	32	−4	31	0	
Oakland, Calif.	80		68		66		57		51		50		48		42		40		
Oklahoma City, Okla.	85	+4	79	+4	62	+1	58	+3	49	+1	43	−1	40	−1	40	+2	39	+3	
Omaha, Nebr.	91	+6	82	+3	69	+3	58	+4	53	+4	50	+4	50	+5	47	+3	48	+6	
Pearl Harbor, Territory of Hawaii.																			
Pensacola, Fla.	86	+3	80	+6	66	+2	59	+2	52	+1	48	0	41	−4	35	−2	31	−5	
Salt Lake City, Utah.	81						71		64		65		66		57		55		
San Diego, Calif.	79	+6	65	+4	59	+8	54	+8	49	+8	45	+9	43	+11	39	+10	37	+11	
Sault Ste. Marie, Mich.	85		89		84		68		57		53		55		58		55		
Scott Field (Belleville), Ill.	80	−2	63	−6	47	−13	45	−9	44	−5	46	−1	46	+2	45	+2	42	+1	
Seattle, Wash.	85		89		87		87		82		82		80		78				
Selfridge Field (Mount Clemens), Mich.	85		80		75		68		53		45		47		46		50		
Spokane, Wash.	85	−1			86	0	80	+5	79	+10	78	+11	77	+12	70	+11	63	+7	
Washington, D. C.	74	+2	56	−8	54	−6	50	−7	43	−9	42	−6	37	−8	33	−10	32	−8	
Wright Field (Dayton), Ohio.	83	+1	75	−3	58	−11	42	−16	38	−13	37	−10	34	−10	29	−12	32	−10	

Observations taken about 4:00 a. m., 75th meridian time, except along the Pacific coast and Hawaii where they are taken at dawn.

[1] Army. [2] Weather Bureau. [3] Navy.

NOTE.—The departures are based on normals covering the following total number of observations made during the same month in previous years, including the current month (years of record are given in parentheses following the number of observations): Billings, 92 (3); Boston, 104 (5); Cheyenne, 93 (3); Fargo, 88 (3); Kelly Field, 77 (3); Lakehurst, 71 (3); Maxwell Field, 70 (3); Mitchel Field, 70 (3); Murfreesboro, 82 (3); Norfolk, 115 (7); Oklahoma City, 87 (3); Omaha, 177 (6); Pensacola, 173 (9); San Diego, 189 (8); Scott Field, 57 (3); Seattle, 40 (7); Spokane, 85 (3); Washington, 188 (12); Wright Field, 65 (3).

TABLE 1.—*Mean free-air temperatures and relative humidities obtained by airplanes during December 1936*—Continued

LATE REPORT FOR NOVEMBER 1936

TEMPERATURE (° C.)

Station	Altitude (meters) m. s. l.																Number of observations
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	
Pearl Harbor, Territory of Hawaii[1] (6 m.)	21.9	−2.2	20.7	−0.8	16.8	−0.9	14.1	−0.8	13.1	+0.1	12.2	+0.8	9.9	+0.8	3.0	0.0	−5.4	−3.4	30

RELATIVE HUMIDITY (PERCENT)

Pearl Harbor, Territory of Hawaii	80	+5	75	0	80	+1	76	+1	60	−5	39	−12	29	−12	21	−10	11	−16	

LATE REPORT FOR OCTOBER 1936

TEMPERATURE (° C.)

Coco Solo, C. Z.[1]	25.7		23.2		20.7		18.4		16.1		13.9		11.7		6.6		1.9		30

RELATIVE HUMIDITY (PERCENT)

Coco Solo, C. Z.	89		87		87		85		84		80		79		80		75		

Observations taken about 4:00 a. m., 75th meridian time, except along the Pacific coast and Hawaii where they are taken at dawn.

[1] Navy.

NOTE.—The departures are based on normals covering the following total number of observations made during the same month in previous years, including the current month (years of record are given in parenthesis following the number of observations): Pearl Harbor, 144 (8).

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 5 a. m.(E. S. T.) during December 1936*

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N. Mex. (1,554 m)		Atlanta, Ga. (309 m)		Billings, Mont. (1,088 m)		Boston, Mass. (15 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cincinnati, Ohio (153 m)		Detroit, Mich. (204 m)		Fargo, N. Dak. (274 m)		Houston, Tex. (21 m)		Key West, Fla. (11 m)		Medford, Oreg. (410 m)		Murfreesboro, Tenn. (180 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	327	1.4	347	1.7	259	3.6	306	2.5	263	3.3	236	1.7	313	0.4	235	2.4	270	1.4	42	1.4	47	2.4	221	0.2	178	0.4
500			68	3.1			316	5.2			246	4.8	231	4.0	248	5.8	270	3.9	95	2.5	89	5.1	198	0.5	169	2.5
1,000			79	1.9			300	7.1			258	8.4	244	6.5	252	7.3	273	5.5	291	1.2	107	4.2	235	1.9	195	3.0
1,500			280	1.4	256	7.9	311	7.4			260	11.8	255	6.5	262	10.8	270	8.3	302	3.3	125	2.4	228	3.6	244	2.8
2,000	271	2.8	305	3.3	275	8.7	303	9.4	261	6.2	265	11.6	282	5.8	279	10.7	282	10.5	290	4.5	155	0.4	266	2.8	278	3.2
2,500	289	4.8	301	5.3	282	9.4	297	7.1	277	12.0	273	12.8	260	4.9	281	11.8	285	12.0	288	6.0	240	1.2	316	3.3	280	4.4
3,000	278	7.4	292	6.5	284	10.8			289	13.1	280	11.5	258	4.4	275	14.0			283	6.8	263	3.0	23	7.9	267	5.1
4,000	265	12.3	266	5.4	285	10.7			285	10.9											227	5.6			267	5.5
5,000	283	9.2							273	10.7																

Altitude (m) m. s. l.	Newark, N. J. (14 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Pearl Harbor, Territory of Hawaii[1] (68 m)		Pensacola, Fla.[1] (24 m)		St. Louis, Mo. (170 m)		Salt Lake City, Utah (1,294 m)		San Diego, Calif. (15 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Spokane, Wash. (603 m)		Washington, D. C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	318	2.1	68	1.4	185	1.9	77	0.2			29	4.0	180	0.5	157	3.3	27	0.7	157	0.9	179	1.7	221	1.0	343	1.6
500	309	4.7	26	1.1	190	5.5	225	2.3			79	5.2	233	4.0			52	0.4	230	4.0	190	2.0			329	3.5
1,000	289	9.4	354	2.4	231	8.4	255	5.1			169	1.4	242	6.6			111	0.4	235	6.6	175	2.3	195	4.6	298	4.0
1,500	283	10.0	332	1.5	249	6.6	266	6.1			360	0.6	261	7.3	170	4.3	325	0.7			196	5.8	227	9.1	304	7.8
2,000	289	10.9	339	1.1	266	5.6	274	8.2			238	1.7	267	7.9	192	5.5	336	2.4			229	5.9	258	8.8	297	8.8
2,500	301	12.0	299	3.9	246	5.8	273	9.3			258	1.4	265	7.9	230	4.4	298	3.1					240	11.8	291	7.6
3,000	292	9.6	319	6.9	271	7.2	275	9.3			313	3.4	271	8.4	265	6.5	301	4.6					239	15.8	292	9.5
4,000					267	8.4					261	8.6	291	7.2	270	9.3	314	6.4					261	14.2		
5,000																										

[1] Navy stations.